

GaAs LIDAR MEASUREMENTS OF LOW-LEVEL CLOUDS

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ABSTRACT

In basic investigations of marine fogs, measurements of cloud base heights up to 1000-2000 feet are necessary. Powerful Q-switched lasers are not required. A GaAs laser transmitter of 200-300 W peak power and average power of only 10 mW (100 n sec-pulse width and 500 hz pulse rate) is entirely adequate for this task in daytime or nighttime.

A lidar using such a transmitter was designed and constructed at the DRI and is now being used to measure cloud base heights in relation to coastal marine fog studies. Time history of cloud buildup and breakup, vertical motion and structure, and short and long term horizontal motion are easily obtained. In addition, light fog buildup at lower altitude is determined in advance of heavy fog conditions.

Additional uses for the instrument in fog studies include intermediate and long path transmission measurements using corner cube retroreflectors or available structures or topographic targets as diffuse reflectors. Simultaneous measurement of transmission and volume backscatter may yield additional information on the optical and physical parameters of fogs.

The cost of a GaAs lidar system can be kept to a relatively modest value by using fresnel lenses for both transmitter collimation and receiver collector and off-the-shelf components for pulsers, high voltage converters, detection and preamplification, and signal averaging electronics. The cost could be reduced still further if range only is desired by using simpler electronics.

The system characteristics will be described. Data obtained showing the temporal relationship between cloud base height and fog formation will be presented. Correlation between lidar data, transmissometer, and other instrumentation will be discussed.